

WHAT IS CLAIMED:

1. 1. A method for supplying an inspired gas to a person, the method comprising the steps of: a) determining whether the person is in the exhalation or inhalation phase of a respiratory cycle; and b) delivering an increased flow of inspired gas to the person during the inhalation phase of the respiratory cycle.
1. 2. The method of claim 1, wherein the inspired gas includes pure gas.
1. 3. The method of claim 2, wherein the pure gas includes oxygen.
1. 4. The method of claim 1, wherein the inspired gas includes a gas mixture.
1. 5. The method of claim 4, wherein the gas mixture includes a mixture of oxygen and air.
1. 6. The method of claim 4, wherein the gas mixture includes a mixture of oxygen and nitrogen.
1. 7. The method of claim 4, wherein the gas mixture includes a mixture of oxygen and water vapor.
1. 8. The method of claim 4, wherein the gas mixture includes a mixture of oxygen and bronchodilators.
1. 9. The method of claim 4, wherein the gas mixture includes a mixture of oxygen and helium.

- 1    10. The method of claim 1, wherein the inspired gas may be released
- 2    to the ambient environment.
- 1    11. The method of claim 1 also comprising the step of determining
- 2    the primary respiratory site; and sampling the person's breath gas
- 3    stream at least in accordance with the determination of the primary
- 4    respiratory site.
- 1    12. The method of claim 11 whereby the gas stream at the mouth is
- 2    continuously sampled, in addition to sampling at the determined
- 3    primary respiratory site.
- 1    13. The method of claim 11, wherein the step of sampling the breath
- 2    gas stream includes the step of monitoring the ventilation of the
- 3    person at least in accordance with the determination of the person's
- 4    primary respiratory site.
- 1    14. The method of claim 13 whereby the gas stream at the mouth is
- 2    continuously sampled, in addition to sampling at the determined
- 3    primary ventilatory site.
- 1    15. The method of claim 1 wherein the inspired gas is delivered to
- 2    the person in the area of the person's nose and mouth.
- 1    16. The method of claim 1, wherein the inspired gas is delivered to
- 2    the person in the area in front of the person's mouth.

- 1    17. The method of claim 1 wherein the determining of whether the
- 2    person is in the exhalation or inhalation phase is accomplished by
- 3    analyzing the pressure in the person's breath gas stream.
- 1    18. The method of claim 17 also comprising the step of monitoring
- 2    the respiratory rate in accord with the pressure analysis.
- 1    19. The method of claim 17 also comprising the step of monitoring
- 2    the inspiratory/expiratory time ratio in accord with the pressure
- 3    analysis.
- 1    20. The method of claim 17, wherein the pressure in the person's
- 2    breath gas stream is determined by sampling pressure at at least
- 3    one respiratory site.
- 1    21. The method of claim 17, wherein the determining of whether the
- 2    person is in the exhalation or inhalation phase is accomplished by
- 3    analyzing the humidity in the person's breath gas stream.
- 1    22. The method of claim 21 also comprising the step of monitoring
- 2    the respiratory rate in accord with the humidity analysis.
- 1    23. The method of claim 21 also comprising the step of monitoring
- 2    the inspiratory/expiratory time ratio in accord with the humidity
- 3    analysis.
- 1    24. The method of claim 17, wherein the determining of whether the
- 2    person is in the exhalation or inhalation phase is accomplished by
- 3    analyzing the temperature in the person's breath gas stream.

- 1    25. The method of claim 24 also comprising the step of monitoring
- 2    the respiratory rate in accord with the temperature analysis.
- 1    26. The method of claim 24 also comprising the step of monitoring
- 2    the inspiratory/expiratory time ratio in accord with the temperature
- 3    analysis.
- 1    27. The method of claim 11, wherein the determining of the primary
- 2    respiratory site is accomplished by sampling pressure at the
- 3    respiratory sites and comparing said pressures.
- 1    28. The method of claim 11, wherein the step of sampling the
- 2    exhaled gas stream includes sampling the level of CO<sub>2</sub> in the
- 3    person's breath gas stream.
- 1    29. The method of claim 13, wherein the monitoring of the
- 2    ventilation is accomplished by measuring the CO<sub>2</sub> levels in the
- 3    person's breath stream.
- 1    30. The method of claim 29, wherein the monitoring of the
- 2    ventilation is accomplished by measuring the end-tidal CO<sub>2</sub> value.
- 1    31. The method of claim 29, wherein the monitoring of the
- 2    ventilation is accomplished by determining the area under the
- 3    expired CO<sub>2</sub> time pilot.
- 1    32. The method of claim 1 also comprising the step of delivering a
- 2    decreased flow of inspired gas to the patient during exhalation.

- 1    33. The method of claim 11, wherein the step of sampling the breath
- 2    gas stream includes monitoring the level of a drug in the person's
- 3    breath gas stream.
- 1    34. The method of claim 33, wherein the drug is an intravenous
- 2    anesthetic.
- 1    35. The method of claim 33 wherein the drug is propofol.
- 1    36. The method of claim 11, wherein the sampled gas is xenon.
- 1    37. An apparatus that delivers inspired gas to a person comprising:
  - 2    a) an inspired gas delivery device; b) at least one respiratory site
  - 3    sampling device which samples the pressure at at least one
  - 4    respiratory site; c) and wherein the respiratory site sampling device
  - 5    is connected to a pressure analyzer which determines the phase of
  - 6    the person's respiration cycle; d) and wherein the inspired gas
  - 7    delivery device is connected to a controller that modulates the flow
  - 8    of inspired gas in accordance with the phase of the person's
  - 9    respiratory cycle.
- 1    38. The apparatus of claim 37, wherein the respiratory site sampling
- 2    device comprises at least one nasal sampling device which samples
- 3    the pressure in the person's nasal airway and an oral sampling
- 4    device which samples the pressure in the person's oral airway.

- 1    39. The apparatus of claim 37, wherein the controller delivers a
- 2    higher flow of inspired gas during the inhalation phase of the
- 3    person's respiratory cycle.
- 1    40. The apparatus of claim 38, wherein at least two of the nasal and
- 2    oral sampling devices are connected to a pressure comparator which
- 3    determines the person's primary respiratory site.
- 1    41. The apparatus of claim 37 also comprising a gas sampling
- 2    device.
- 1    42. The apparatus of claim 41, wherein the gas sampling device is a
- 2    capnometer.
- 1    43. The apparatus of claim 41, wherein the gas sampling device
- 2    comprises a nasal gas sampling device and an oral gas sampling
- 3    device and wherein the controller selects at least the gas stream
- 4    from the primary respiratory site for monitoring.
- 1    44. The apparatus of claim 43, wherein the oral and nasal gas
- 2    sampling devices are capnometers.
- 1    45. The apparatus of claim 37 also comprising a flow control valve
- 2    and wherein the controller runs software that indicates an error to
- 3    a user if while the flow control valve is open, the controller detects
- 4    pressure at the source of inspired gas but fails to detect pressure
- 5    downstream of the flow control valve.

- 1    46. The apparatus of claim 37 also comprising an auditory breath
- 2    sonification device that amplifies breath sounds.
- 1    47. The apparatus of claim 46, wherein the auditory breath
- 2    sonification device is a microphone that amplifies actual breath
- 3    sounds.
- 1    48. The apparatus of claim 46, wherein the auditory breath
- 2    sonification device comprises a white noise generator that provides
- 3    simulated breath sounds.
- 1    49. The apparatus of claim 48, wherein said simulated breath
- 2    sounds distinguish between inhalation and exhalation breath
- 3    sounds.
- 1    50. The apparatus of claim 41, wherein the gas sampling device
- 2    samples CO<sub>2</sub> gas.
- 1    51. The apparatus of claim 41, wherein the gas sampling device
- 2    samples xenon gas.
- 1    52. The apparatus of claim 41, wherein the gas sampled is a drug.
- 1    53. The apparatus of claim 52, wherein the drug is an intravenous
- 2    anesthetic.
- 1    54. The apparatus of claim 52, wherein the drug is propofol.
- 1    55. The apparatus of claim 37, wherein the inspired gas delivery
- 2    device comprises a diffuser.

- 1    56. The apparatus of claim 37, wherein the controller reduces the
- 2    flow of inspired gas during the exhalation phase.
- 1    57. A method for delivering an inspired gas, the method comprising
- 2    the steps of: a) determining the breath phase; b) delivering a higher
- 3    flow of inspired gas during the inhalation phase; and c) monitoring
- 4    gases in the breath gas stream.
- 1    58. The method of claim 57 also comprising the step of determining
- 2    at least one of the breath rate and inspiratory/expiratory time ratio.
- 1    59. The method of claim 57, wherein the step of determining at least
- 2    one of the breath phase, breath rate and inspiratory/expiratory time
- 3    ratio is accomplished by analyzing the pressure waveform at at
- 4    least one respiratory site.
- 1    60. The method of claim 57, wherein the step of determining at least
- 2    one of the breath phase, breath rate and inspiratory/expiratory time
- 3    ratio is accomplished by monitoring the humidity at at least one
- 4    respiratory site.
- 1    61. The method of claim 57, wherein the step of determining at least
- 2    one of the breath phase, breath rate and inspiratory/expiratory time
- 3    ratio is accomplished by monitoring the temperature at at least one
- 4    respiratory site.
- 1    62. The method of claim 57 also comprising the step of reducing the
- 2    flow of inspired gas during the exhalation phase.

- 1    63. The method of claim 57, wherein the monitoring of exhaled gas
  - 2    is performed during a period of low gas flow in the exhalation
  - 3    phase.
- 1    64. The apparatus of claim 37 also comprising a plurality of lumens
  - 2    which effect one or more of delivering of inspired gas, respiratory
  - 3    site sampling and gas sampling and wherein said lumens are
  - 4    affixed to one another along separable tear lines.
- 1    65. The apparatus of claim 64, wherein the lumen that
  - 2    accommodates the flow of inspired gas is of larger circumference
  - 3    than the other lumens.
- 1    66. An apparatus according to claim 64 wherein one of said lumens
  - 2    is a stimulus channel that carries an auditory prompt to the person.
- 1    67. A pneumatic harness for a medical device comprising a plurality
  - 2    of lumens grouped in one or more clusters, said clusters being
  - 3    manually separable from one another.
- 1    68. The pneumatic harness of claim 67, wherein the harness also
  - 2    comprises tear lines to permit separation of the lumens from one
  - 3    another.
- 1    69. The pneumatic harness of claim 67, wherein at least one of the
  - 2    lumens is larger than the other lumens.
- 1    70. The pneumatic harness of claim 67, wherein the cross section of
  - 2    each cluster is of aerofoil shape.

- 1    71. The pneumatic harness of claim 67 also comprising a connector
- 2    that permits delivery of supplemental oxygen from standard
- 3    medical oxygen connectors using an oronasal piece.
- 1    72. The pneumatic harness of claim 67 also comprising an adapter
- 2    that connects the pneumatic harness to a medical device.
- 1    73. A method of determining which of the two nares is less
- 2    obstructed, said method comprising the steps of: a) sampling the
- 3    pressure in the gas stream of each nare; b) comparing the pressure
- 4    variations in the gas stream within each nare; c) comparing the
- 5    extent of variation of said pressures as between the nares; and d)
- 6    selecting the nare with the larger pressure variation as the nare
- 7    that is less obstructed.
- 1    74. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected to receive inspired gas.
- 1    75. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected for gas sampling.
- 1    76. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected for pressure sampling.
- 1    77. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected for determination of respiration phase.
- 1    78. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected for determination of respiration rate.

- 1    79. The method of claim 73, wherein the nare that is less obstructed
- 2    is selected for determination of inhalatory/expiratory time ratio.